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SURVEY OF THE CALVING GROUNDS OF THE BEVERLY CARIBOU HERD, 1980

Gunn Heckert
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N.W.T. WILDLIFE SERVICE

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ABSTRACT

The Beverly caribou herd was estimated to number 105,000 caribou over 1 year of age from a census of the calving ground, 7-8 June, 1980. The estimate of total population size signifies the continued downward trend of the population. Calving was north of the Thelon River and covered an area of 5,300 km^2. The western edge of the calving ground had to be subjectively delineated because of the influx of young bulls and yearlings onto the calving ground and this subjective decision may have reduced the population estimate. Ground segregations on 13 and 14 June also emphasized the high proportion of non-breeders as breeding cows were only 69% of caribou on the calving ground compared to 81% in June, 1978. The second problem with the census which likely reduced the estimate was the disparity between the left (inexperienced) and the right (experienced) observer.

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INTRODUCTION

The Caribou Technical Committee reviewed the status of the Beverly herd in December, 1979. A brief status report accepted that the herd was declining but that the rate of decline was unknown. The uncertainties over reliability of surveys previous to 1978 confounded quantification of the rate of decline. In 1978, Heard and Decker (1981) had estimated 52,504 ± 4,797 1+ year old caribou on the calving ground.

The decline of the Kaminuriak herd, extensive fires on the winter range of the Beverly herd in summer 1979 and imposition of the Caribou Protection Measures on the calving and post-calving areas have focused attention on the size and status of the Beverly herd. The public eye was focused on the herd by the details of an exceptionally high kill that followed from the deep penetration of the Beverly caribou into Saskatchewan in the winter of 1979/80.

With this background, we were especially anxious to estimate the size of the Beverly herd in June, 1980. We used the methodology developed by D. Heard and the rationale for the design and technique are detailed in Heard (1980a). Essentially, the approach depends on the fact that all breeding cows return to a traditional calving ground which is northwest of Baker Lake for the Beverly herd (Fig. 1). An estimate of the number of breeding cows and knowledge of the herd's composition are combined to estimate the total size of the herd.

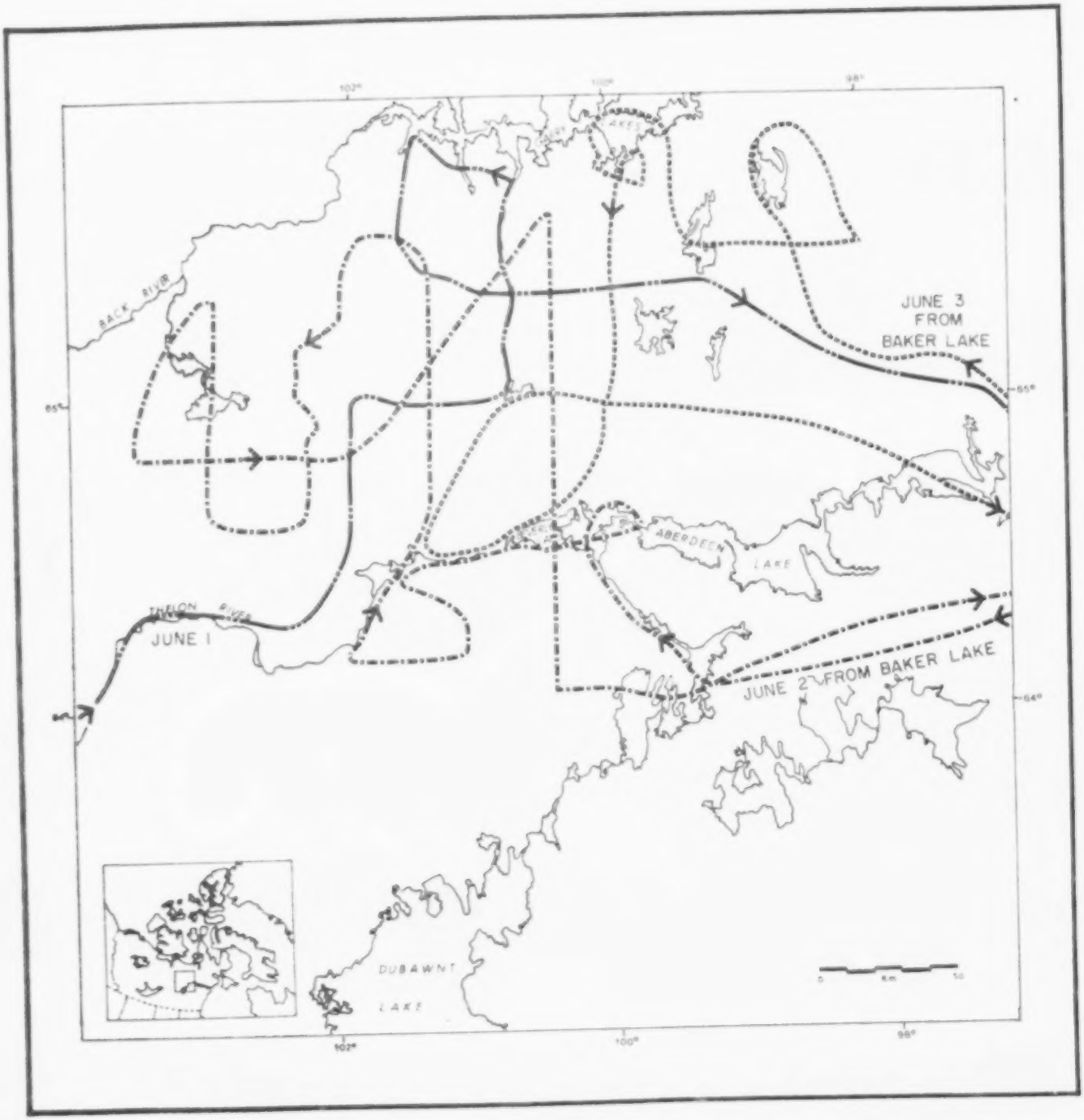

Figure 1. Area covered and routes of non-systematic reconnaissance flights to locate the Beverly caribou calving ground, June, 1981.

METHODS

Calving Ground Location and Population Size

Surveys were conducted 1 June to 9 June, 1980 with a Cessna 337 based at Baker Lake. We determined locations of concentrations of cows during spaghetti reconnaissance flights whose course was largely determined from known locations of the calving grounds in previous years. Systematic reconnaissance flights at 9.6 km intervals and orientated north-south were used to delimit the calving ground. The densities estimated during the systematic reconnaissance flights were the basis for stratification of the calving ground and determination of the sampling effort for each stratum. The number of 1 year-old caribou on the calving ground was estimated from caribou counted on two strata - the strata were covered with north-south transects at 1.6 km and 6.2 km intervals on Strata I and II, respectively.

The spaghetti reconnaissance flights were at altitudes varying from 90 m, agl to 180 m, agl, and at air speeds of 160-200 km/hr. Transect strips were not used during these reconnaissance flights. All transects were flown at 122 m above ground level and at an airspeed of 160-176 km/hr. One person sat in the front right seat to assist the pilot with navigation and to act as an extra observer. The pilot navigated and marked observations by a location number on 1:250,000 maps. He called the location numbers to the two rear observers who were recording numbers and classifications of caribou on taperecorders. The observers counted caribou within a 0.4 km wide strip marked by tape on the wing strut of each side. The position of marks was determined by flying at 122 m agl over two drums 0.4 km

apart. The blind spot under the aircraft was excluded from those two 0.4 km strips.

Classification of caribou into sex-age classes during all flights were restricted to calves, bulls and others. Calves were obvious by their small size and light or reddish colour, and bulls were identified by the dark velvet of their developing antlers.

Composition of the Calving Ground Caribou

To extrapolate from the estimate of numbers of caribou over 1 year of age on the calving ground to the total number in the population, three parameters are required, one of which is the proportion of breeding females on the calving ground. We obtained a measure of that proportion during ground segregation counts. Our base was a field camp 90 km east of the calving ground.

We used a Bell 206B helicopter to locate different concentrations of caribou on the calving ground by flying at altitudes of 90-200 m agl. On locating caribou, the pilot flew toward the caribou and attempted to minimize disturbance by using ridges and hummocks as shields to land out of sight of the caribou. Two observers walked up the nearest high land and approached to within 200-400 m of the caribou. One observer used a spotting scope (x20) to look at the caribou and the classifications were recorded by the second observer. We attempted to classify all the animals within any one group. We used the following categories: cows with calves, calfless cows with or without distended udders, bulls with antlers in dark velvet, adults of unknown sex, and yearlings. We did not attempt to sex either yearlings or calves.

We spread our sampling locations throughout both Strata I and II as far as was possible and sampled groups of all sizes. The selection of the groups was largely determined by the terrain offering an undisturbed approach and if the approach was seen to cause trotting or galloping, we abandoned the effort.

RESULTS

Delimination of the Calving Ground and Strata

We flew spaghetti reconnaissance flights on 1,2, and 3 June, 1980 (Table 1). The area covered (Fig. 1) included south of Beverly Lake, north to Garry Lakes, east to Deep Rose Lake and west to the Tammarvi and Consul Rivers. Most cows were concentrated in an area immediately east of an unnamed river draining north toward Upper Garry Lake (hereafter referred to as "Garry River"). West of the river, there were cows with increasing proportions of young bulls and yearlings present, and those caribou appeared to be still moving northeast.

The area of systematic reconnaissance extended from the beginning of cow sightings along the west shore of Deep Rose Lake west to where few cows were observed among bull and yearling groups. The northern and southern boundaries were based on an average of 10 km flown past the last sighting of caribou, except on lines 17 and 18. On those two lines the southern boundary was set at 2 km south of the last cow group spotted.

The 18 transect lines covered an area of 9,100 km^2 at 9.6 km intervals and were flown on 5 June. The 874 km of transects resulted in a coverage of 699 km^2 or 8% of the area flown (Appendix A). The densities of caribou on transect varied from an average of 0.36 caribou/km^2 for the most eastern three lines (Transects 1-3), through a high density area (Transects 4-9; average density 10.47 caribou/km^2 of transect) and a lower density area (Transects 10-14; 3.3 caribou/km^2). Transects 1-3 were dropped because of the low densities and 15-18 were also dropped as there were few cows in proportion to yearlings and bulls.

Table 1. Time flown during spaghetti, systematic reconnaissance, and census surveys of the Beverly calving ground, June 1980.

Dates (June 1980)	Flight duration (hours)			
	Spaghetti reconnaissance	Systematic reconnaissance	Census survey	Ferry time
1	1.0			5.4*
2	5.4			2.0
3	2.6			2.2
5		7.5		1.5
6			2.6	2.4
8			9.2	4.4
9				5.5*
Total	9.0	7.5	11.8	23.2

* Includes ferry trip from Yellowknife to Baker Lake and return.

The calving ground ran as a long narrow band, stretched from southwest of the Consul River northeast across the "Garry River" to north of Sand Lake ($65^{o}00'$ - $65^{o}41'$ N, $101^{o}31'$ W) and lay completely within the boundaries of the Caribou Protection Area and the Thelon Game Sanctuary (Fig. 2).

Stratification

The calving ground was divided into two strata based on the results of the systematic reconnaissance. The sharp divisions in density between transects 3 and 4 (0.9 and 17.9 caribou/km^2, respectively) and between transects 9 and 10 (14.3 and 0.5 caribou/km^2, respectively) were used to delimit Stratum I (2,480 km^2). There were also a change at the western edge of Stratum II (2,808 km^2) between transects 14 and 15 of the systematic reconnaissance (3.1 and 8.3 caribou/km^2, respectively).

The number of aircraft hours available and the densities of caribou were used to estimate the effort (number of transects) for the census of the two strata (Heard 1980a).

Estimate of the Calving Ground Population

Stratum II was surveyed on 6 June with 10.7% coverage and 697 caribou were counted on the 397 km of transect (Appendix B). The total number of 1+ year-old caribou was estimated at 6,489 $\pm$ 1,215 SE (Table 2). The area of Stratum I was slightly smaller than that of Stratum II but coverage was 38.6% and 1,480 km of trasects were flown (Appendix C) on 8 June. The average density of caribou on Stratum I was higher than Stratum II being 16.2 caribou/km^2 and 2.31

Table 2. Data from 1980 Beverly calving ground census as used in calculation of total population estimate.

		Stratum I	Stratum II	Total
Maximum no. transects	(N)	96	62	
No. transects surveyed	(n)	47	8	
Stratum area, km^2	(Z)	2,480	2,808	
Area counted, km^2	(z)	957.6	301.6	5,288
Caribou counted	(y)	15,486	697	16,183
Caribou density, km^2	(R)	16.2	2.31	
Population estimate	(Y)	40,160	6,489	46,649
Population variance	(VAR, Y)	766,349	1,476,603	
Standard error	(SE, Y)	2,768	1,215	
Coefficient of variance	(CV)	0.07	0.19	

caribou/km^2, respectively (Table 2). On Stratum I 15,486 caribou were counted and the total number of caribou was estimated at 40,160 $\pm$2,768 SE (Table 2).

Group Size and Dispersion

The average group size was 6.8 caribou in Stratum I (n=2,264, range = 1-200) and 2.4 in Stratum II (n=288, range = 1-75). The caribou in larger groups could not be individually counted and were estimated. In Strata I and II, the percentages of groups estimated to have more than 50 caribou were 2.7% and 0.3%, respectively of all groups seen. In Stratum I, the average estimated size of the 61 groups with more than 50 caribou was 107 caribou and those 61 groups accounted for 42% (6,518/15,486) of the caribou counted. In Stratum II, the one group estimated at more than 50 caribou accounted for 11% (75/697) of the caribou counted.

Observer Error

There was a significant ($p < 0.01$) difference between the left and right observer (Wilcoxon matched pairs test). The right observer (experienced) counted 34.6% more caribou than the left (inexperienced) observer (Appendices A - C). Both observers saw almost the same number of groups estimated with more than 50 caribou but the left observer tended to estimate less caribou in larger groups (mean = 58) compared to the right observer (mean = 129).

Sex and Age Composition of the Caribou on the Calving Ground

We classified 2,445 caribou of 1+ year-age (Table 3) on the calving ground at 46 different locations on 13 and 14 June (Fig. 2). The selection of groups was largely determined by whether the surrounding terrain offered the opportunity to land and observe the caribou without too much disturbance. We attempted, however, to segregate groups of different sizes; mean group size was 53 caribou, the range was 2 to 331. Efforts were made to count entire groups but the caribou were forming into postcalving aggregations of 500-1000+ which were not densely aggregated but split by terrain into small sub-groups.

The weighted mean proportion of breeding females (cows with calves or with distended udders) was 70.8% of the total 1+ year-old caribou that we segregated. Of those breeding females (1,689), 86.2%, (1,456) were still accompanied by calves. Barren females were caribou almost invariably without hard antlers, distended udder or new antler growth, and the 127 cows so classified were 7.0% of the total cows seen or 5.2% of all 1+ year-old caribou.

We classified 329 caribou as yearlings on the basis of smaller body size and "baby" face but we noted considerable variation in antler growth. Most yearlings had 10-15 cm of antler in dark velvet but some yearlings (1979 calves) represented 13.4% of the sample, and caribou classified as bulls were 6.3% of the sample. Bulls had larger bodies, larger faces and antlers in dark velvet that were distinctly branched. We could not classify 6.0% of the caribou seen but they were probably barren cows or cows that lost calves as we did not see new antler growth or an udder or calf.

Table 3. Composition of Beverly caribou segregated on calving ground Strata I and II, 13 and 14 June, 1980.

Location		Cows: Breeding Cows* with calves	Cows: Breeding Cows* with udders	Cows: Breeding Cows* barren	Cows: Yearlings	Young Bulls	Unknown	Total Sample size
Stratum I								
Northeast section	(No.)	520	99	41	49	25	66	800
(Location points 1-6)**	(%)	(65.0)	(12.4)	(5.1)	(6.1)	(3.1)	(8.3)	
Central location	(No.)	476	64	29	50	33	18	670
(location points 7-15, 31)	(%)	(71.0)	(9.6)	(4.3)	(7.5)	(4.9)	(2.7)	
Stratum II								
(Location points 1-30)	(No.)	460	70	57	230	95	63	975
	(%)	(47.2)	(7.2)	(5.8)	(23.6)	(9.7)	(6.5)	
Total		1,456	233	127	329	153	147	2,445

** Proportion of breeding cows on the calving ground (70.8%) is calculated as the mean of the proportion of breeding cows on each of the 3 sample areas (77.4%; 80.6% and 54.4%)

* Location points refer to Figure 2.

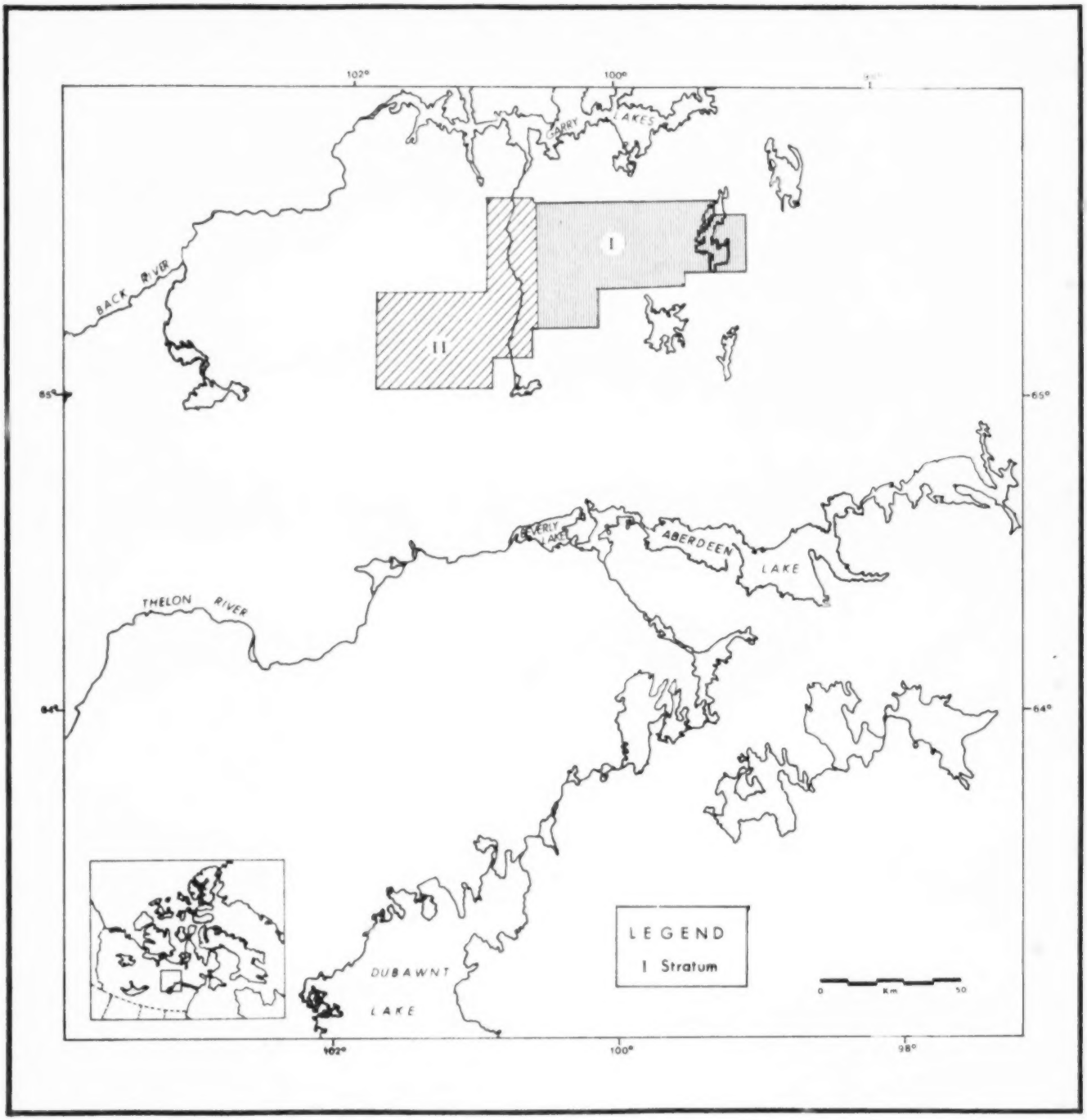

Figure 2. Strata I and II of the census of the Beverly caribou calving ground, June, 1981.

When we examine the results by location there was a clear increase in bulls and yearlings from Stratum I to II (Table 3). On 13 June, we found the caribou discontinuously distributed in Strata I with cows and calves in the northeast corner; a group of 2,000-3,000 cows on the flat sedge area north of Sand Lake and then a concentration of cows and calves 6-10 km east of "Garry River", many of which were walking west and southwest. Composition of the groups in the northeast corner were similar in composition of to those in the west part of Stratum I (Table 3).

Timing of Calving

We first saw newborn calves on 2 June on the southwest edge of the calving ground (65°00' N, 100°45' W). We saw about 17 calves and those seen standing had bent hocks and backs suggesting they were only about a day old.

Our emphasis on counting 1+ year-old caribou on transect and the difficulty of observing bedded calves prevent us from plotting caribou-calf ratios against time to disearn the peak of calving. Our impressions and the fact that dispersal appeared to be maximal on about 8 June, suggested the peak of calving was about 8 June.

During the ground segregation counts on 12 and 13 June, we observed a cow in labour, and two newborn calves being licked clean by their cow.

Visibility Conditions

The weather conditions during the flights varied (Table 4) but were generally favourable. Snow cover was rapidly melting and was

Table 4. Weather conditions during the 1980 aerial survey of Beverly calving ground.

Date	Cloud		Precipitation	Wind (Knots)	Visibility of caribou
	Cover	Ceiling (m, agl)			
1 June	Broken to overcast	500 - 400	Snow-squalls	NW 5-15	Good
2 June	Overcast	100 - 200	Snow-squalls	NW 5-10	Fair
3 June	Scattered	300+	--	W 5	Excellent
4 June	Scattered	300+	--	—	--
5 June	Broken to overcast	30 - 200	Snow showers	N 10	Fair
6 June	Broken to overcast	100 - 200	Snow-squalls	NW 20	Fair to good
7 June	Overcast	100	snow, sleet	NW 25	--
8 June	Broken to overcast	100 - 300	--	NW 10	Good to excellent

visually estimated at 10-20% in the west and 40-60% in the east, north of Sand Lake, by 8 June. The Thelon River was flowing but other rivers and lakes were still frozen during the survey.

Calf Mortality and Observations of Predators

We observed no cow or calf carcasses during the fixed wing census. We found two calf carcasses during the ground segregations; one was intact but when we skinned it we found the skull was perforated and crushed. It was still warm and the cow remained within 150 m while we examined the calf. The second calf had had the lung and intestinal cavity contents removed, half the tongue eaten and had crushed ribs. Two gulls were in the immediate vicinity of the carcass and may have already started to scavenge it. We saw no wolves or bears during the composition counts on 13 and 14 June. During the census, we observed three grizzlies and six wolves on the calving grounds.

Estimate of Total Population Size

The rationale for and the assumptions inherent in the estrapolation of the estimate of the calving ground population to the total population are discussed by Heard (1981).

$$\text{Total Population} = \frac{\text{(bias correction) (calving ground estimate)}}{\text{(proportion breeding on calving ground)}} \Big/ \frac{}{\text{(proportion in population) (proportion breeding)}}$$

$$= (1.25)(46{,}649)(0.708)/(0.567)(0.694)$$
$$= 104{,}960$$ where:

1.25 - observer bias correction Heard 1981,
46,649 - see Table 2, this report
0.708 - see Table 3, this report
0.567 - 1980 fall segregation, (Heard 1980a)
0.694 - Kaminuriak-data, (Dauphiné 1976).

The variance of the estimate of total population was calculated as by Heard 1980b (Appendix D). Using Heard's (1980b) assumptions, the chance is 95% that the Beverly herd is 57,000 to 160,000 (coefficient of variance, 0.20; standard error, 18,683).

DISCUSSION

The total population estimate of 105,000 confirmed the continuation of the apparent decline of the Beverly population. The herd has declined from 210,000 in 1971 to 130,000 in 1978 (Heard 1980b) and now, 2 years later to 105,000. Harvests have been high, 7,000-8,000 in 1977-78 and 1978-79. In 1979-80, the herd's deep penetration into Saskatchewan, resulted in a kill of about 17,000. Before 1977, the harvest figures were based on returns from General Hunting Licences and are too unreliable to be used.

There are no accounts of unusual movements or evidence of the herd splitting which could account for at least part of the decline. The surveys of the calving grounds since 1970 show an apparent downward trend. There has been a reduction in the use of the southern pard of the winter range in the last three decades (except the unusual movement in 1979-80) which would also support the downward trend of the Beverly herd (W. Runge pers. comm.).

The area of the calving ground was larger than in 1978 (Darby 1979, Heard and Decker 1981), but considerably smaller than in 1979, when a late spring delayed spring movements. The density on the calving ground was 8.2/km^2 in 1980 compared to 18.7/km^2 in 1978.

The calving ground was north of the Thelon River as it was in 1978 (Heard and Decker 1981) and in 1979 (Darby 1979). There was no evidence to suggest use of a southern segment of the calving ground as regularly occurred before 1978. Spring was relatively early in 1980 and the caribou cows were about 10 days ahead of the average schedule of spring migration (Cooper 1981). The early spring and good travelling conditions likely explained the high proportion of yearling

and young bulls among the cows on the calving ground. On the Kaminuriak calving ground in 1980, Heard (1980a) also found a higher proportion of non-breeding caribou than usual on the calving ground. The ground segregations on the Beverly calving ground in 1978 wwere carried out 3 weeks after the census (Heard and Decker 1981) and may not be comparable with our segregation results which were 1 week after the census.

The variation in the proportion of breeding cows on the calving grounds emphasizes the importance of carrying out ground composition counts during or as soon after the census as possible. The proportion of breeding cows is one of the variables used in the calculation of the total population.

The two problems with the 1980 census which we believe reduce the reliability of the estimate are the differences between the left and right observer and the delimitation of the strata. There is no way of correcting the low counts of one observer by the high counts of the other observer without making an assumption about the distribution of the caribou relative to the aircraft. If distribution relative to the aircraft was such that the observers should see equal numbers of caribou, the left observer's count could be adjusted to equal the right observer's count. The resulting population estimate using that assumption would be about 116,500 caribou, however, we only offer this adjusted estimate to underscore the need for experienced and tranined observers.

The second problem that likely has resulted in a low estimate of the population was the delimitation of the western edge of the calving ground. Unlike in 1978 and 1979, there was a greater influx of non-breeding caribou onto the calving ground. The decision to drop

lines 15-18 of the systematic reconnaissance when delimitating Stratum II was not based on a numerical criterion of the proportion of breeding to non-breeding caribou. In years, when the non-breeders have reached the calving ground in high numbers stratification should be based on composition as well as density, i.e. ground segregation has to be during or immediately before or after the census to provide data for an objective delimitation of the strata.

RECOMMENDATIONS

The difference between the left and right observers emphasizes the need to train and use experienced observers. Furthermore, a refresher course using 35 mm slides to practise estimation of groups sizes prior to a census should become standard practice.

The establishment of a base camp on or at the periphery of the calving ground would facilitate both the census and post-census composition count. The reduction of ferry time and ability to evaluate the on-site weather would be advantageous and more efficient as compared to use of Baker Lake as a base. A base camp would necessitate a ski or wheel-ski aircraft such as a Beaver or Cessna 185.

The use of long-range aircraft with capability of only landing at prepared strips is undesirable for a calving ground census. Our use of the C337 decreased the efficiency of observers because fatigue of flying for long periods as the plane could only land at Baker Lake.

Ground segregations to obtain the proportion of breeding cows on the calving ground are essential and should be carried out preferably during the census or immediately after the census.

ACKNOWLEDGEMENTS

We thank Edwin Evo (Baker Lake) and W. Runge (Biologist, Department of Northern Saskatchewan) for their assistance as observers. S. Cooper gave assistance during the ground segregations and he also provided information on spring movements and accommodation at Baker Lake. D. Heard provided statistical advice. L. Buckmaster (Buffalo Airways) and R. Tessier (Associated Helicopters) were our helpful and patient pilots. We appreciated the hospitality of Seru Nucleaire (Canada) Ltd. in providing accommodation at their field camp.

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Appendix A. Number of caribou (1+ year-old) on transects during systematic reconnaissance of Beverly calving ground, 1980.

Transect No.	Length (km)	Area (km^2)	Number of non-calves counted		Total
			Left Observer	Right Observer	
1	38.4	30.7	0	7	7
2	46.4	37.1	3	1	4
3	33.6	26.9	3	20	23
4	46.4	37.1	127	537	664
5	43.2	34.6	172	216	388
6	42.2	33.8	42	128	170
7	32.0	25.6	32	41	73
8	41.6	33.3	201	96	297
9	41.6	33.3	267	210	477
10	76.8	61.4	3	25	28
11	57.6	46.1	94	138	232
12	67.2	53.8	24	60	84
13	46.4	37.1	42	64	106
14	44.8	35.8	64	46	110
15	32.0	25.6	88	124	212
16	49.6	39.7	79	91	170
17	41.6	33.3	127	188	315
18	92.8	74.2	102	53	155
Total	874.0	699.4	1470	2045	3515

Appendix B. Number of caribou (1+ year-old) on transects of Stratum II, Beverly calving grounds, June 1980.

Transect No.	Length (km)	Area (km^2)	Number of non-calves counted: Left Observer	Right Observer	Total
2	61.0	48.8	78	52	130
3	61.0	48.8	6	55	61
4	75.0	60.0	8	29	37
5	40.0	32.0	52	133	185
6	40.0	32.0	59	29	88
7	40.0	16.0	13	*	13
8	40.0	32.0	54	25	79
9	40.0	32.0	16	88	104
Total	397.0	301.6	286	411	697

* Tape recorder malfunction.

Appendix C. Number of caribou (1+ year-old) on transects of Stratum I, Beverly calving grounds, June 1980.

Transect No.	Length (km)	Area (km^2)	Number of non-calves counted (calves in parenthesis) Left Observer	Right Observer	Total
1	17.6	14.1	2	0	2
2	17.6	14.1	0	0	0
3	17.6	14.1	0	(1) 4	4
4	17.6	14.1	13	3	16
5	17.6	14.1	0	8	8
6	17.6	14.1	0	1	1
7	24.0	19.2	1	0	1
8	24.0	19.2	4	31	35
9	24.0	19.2	38	165	203
10	24.0	19.2	219	396	615
11	24.0	19.2	305	741	1,046
12	24.0	19.2	134	(6) 203	337
13	30.4	24.3	0	140	140
14	30.4	24.3	(13) 227	(1) 715	942
15	30.4	24.3	(9) 305	360	665
16	30.4	24.3	(23) 231	(1) 385	616
17	30.4	24.3	(15) 134	(1) 445	579
18	30.4	24.3	(9) 546	378	924
19	30.4	24.3	211	180	391
20	30.4	24.3	(3) 84	69	153
21	30.4	24.3	(1) 108	183	291
22	30.4	24.3	(7) 39	69	153
23	30.4	24.3	(6) 106	(2) 133	239
24	30.4	24.3	(6) 361	(1) 69	430
25	30.4	24.3	(3) 35	(1) 170	205
26	30.4	24.3	(8) 377	137	514
27	30.4	24.3	(6) 95	276	371
28	30.4	24.3	166	(2) 53	219
29	30.4	24.3	(3) 18	(2) 45	63
30	30.4	24.3	62	44	106
31	30.4	24.3	(4) 79	112	191
32	30.4	24.3	36	62	98
33	30.4	24.3	(2) 106	119	225
34	30.4	24.3	(2) 112	112	224
35	30.4	24.3	(1) 176	304	480

...continued

Appendix C. (continued)

Transect No.	Length (km)	Area (km^2)	Number of non-calves counted (calves in parenthesis) Left Observer	Right Observer	Total
36	21.6	17.3	407	278	685
37	21.6	17.3	184	190	374
38	21.6	17.3	72	51	123
39	21.6	17.3	240	41	281
40	21.6	17.3	150	233	383
41	21.6	8.6	(1) 61	*	61
42	21.6	17.3	(1) 78	144	222
43	21.6	17.3	(1) 219	275	494
44	21.6	17.3	(5) 248	341	589
45	21.6	17.3	154	151	305
46	21.6	17.3	(2) 139	301	440
47	21.6	17.3	(4) 381	(1) 706	1,087
Total	1,480.0	957.6	(143) 6,663	(21) 8,823	15,486

* Tape recorder malfunction.